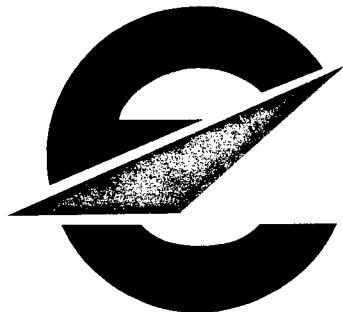


EUROPEAN ORGANISATION  
FOR THE SAFETY OF AIR NAVIGATION



PB98-164320

**EUROCONTROL**

**EUROCONTROL EXPERIMENTAL CENTRE**

**COVERAGE OF EUROPEAN AIR TRAFFIC  
FOR THE BASE OF AIRCRAFT DATA (BADA)  
REVISION 3.0**

**EEC Note No. 8/98**

**EEC Task D09  
EATCHIP Task SDV-D-E7**

**Issued: March 1998**

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## REPORT DOCUMENTATION PAGE



PB98-164320

<b>Reference:</b> EEC Note 8/98	<b>Security Classification:</b> Unclassified					
<b>Originator:</b> EEC - APO (Aircraft Performance and Operations)	<b>Originator (Corporate Author) Name/Location:</b> EUROCONTROL Experimental Centre B.P.15 F - 91222 Brétigny-sur-Orge CEDEX FRANCE Telephone : +33 1 69 88 75 00					
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<b>TITLE:</b>  <b>Coverage of European Air Traffic for the Base of Aircraft Data (BADA) Revision 3.0</b>						
<b>Author</b> A.Bos	<b>Date</b> 3/98	<b>Pages</b> iv + 6	<b>Figures</b> 1	<b>Tables</b> 0	<b>Appendix</b> 2	<b>References</b> 2
<b>EATCHIP Task Specification</b> SPT	<b>EEC Task No.</b> D09		<b>Task No. Sponsor</b>		<b>Period</b> 1/97 to 3/98	
<b>Distribution Statement:</b> (a) Controlled by: Head of APO (b) Special Limitations: None (c) Copy to NTIS: YES / NO						
<b>Descriptors (keywords):</b> aircraft model, total-energy model, BADA, aircraft types, air traffic statistics						
<b>Abstract:</b> The air traffic statistics from the CFMU for December 1997 and January 1998 are used to determine the coverage of European air traffic by the Base of Aircraft Data (BADA) Revision 3.0. BADA consists of a set of aircraft models used at the EEC and other European research institutes for aircraft trajectory simulation. The results show that the 67 aircraft types within BADA 3.0 cover 89.4% of the European air traffic. The addition of 1 type would bring the coverage to the target of 90%.						

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**Coverage of European Air Traffic  
by the  
Base of Aircraft Data (BADA) Revision 3.0**

EUROCONTROL Experimental Centre

**Summary**

The air traffic statistics of the CFMU for December 1997 and January 1998 are used to determine the coverage of European air traffic by the Base of Aircraft Data (BADA) Revision 3.0. BADA consists of a set of aircraft models used at the EEC and other European research institutes for aircraft trajectory simulation. The results show that the 67 aircraft types within BADA 3.0 cover 89.4% of the European air traffic. The addition of 1 type would bring the coverage to the target of 90%.



## Table of Contents

<b>1. INTRODUCTION.....</b>	<b>1</b>
<b>1.1 Identification and Scope.....</b>	<b>1</b>
<b>1.2 Referenced Documents.....</b>	<b>1</b>
<b>1.3 Glossary of Acronyms .....</b>	<b>2</b>
<b>2. AIR TRAFFIC STATISTICS.....</b>	<b>3</b>
<b>2.1 CFMU Statistics.....</b>	<b>3</b>
<b>2.2 CFMU Aircraft Identifiers.....</b>	<b>4</b>
<b>2.3 Comparison with BADA.....</b>	<b>4</b>
<b>3. CONCLUSIONS .....</b>	<b>6</b>

**APPENDIX A: CFMU Traffic Statistics**

**APPENDIX B: BADA 3.0 Coverage Statistics**



# 1. INTRODUCTION

## 1.1 Identification and Scope

This document reviews the air traffic statistics received from the EUROCONTROL Central Flow Management Unit (CFMU) in order to determine the coverage of European air traffic provided by BADA (Base of Aircraft Data) Revision 3.0 [RD1].

BADA 3.0 is a collection of ASCII files which specifies operation performance parameters and operating procedure parameters for 67 different aircraft types. This information is designed for use in trajectory simulation and prediction algorithms within the domain of Air Traffic Management (ATM). All files are maintained within a configuration management system at the Eurocontrol Experimental Centre (EEC) at Brétigny-sur-Orge, France.

This document is presented in three sections, including Section 1, the Introduction. A discussion of the coverage statistics is presented in Section 2 with conclusions summarised in Section 3.

## 1.2 Referenced Documents

- RD1** User Manual for the Base of Aircraft Data (BADA) Revision 3.0; EEC Note 6/98; January 1998.
- RD2** Aircraft Type Designators; ICAO Document No. 8643 25th Edition; January 1997.

### 1.3 Glossary of Acronyms

<b>A/C</b>	Aircraft
<b>APO</b>	Centre for Aircraft Performance and Operations
<b>ASCII</b>	American Standard Code for the Interchange of Information
<b>ATM</b>	Air Traffic Management
<b>BADA</b>	Base of Aircraft Data
<b>CFMU</b>	Central Flow Management Unit
<b>CRCO</b>	Central Route Charges Office
<b>EEC</b>	Eurocontrol Experimental Centre
<b>ICAO</b>	International Civil Aviation Organisation
<b>IFR</b>	Instrument Flight Rules
<b>UM</b>	User Manual

## 2. AIR TRAFFIC STATISTICS

### 2.1 CFMU Statistics

European air traffic statistics for December 1997 and January 1998, as provided by the EUROCONTROL CFMU, are included in this Note as Appendix A.

The statistics list all aircraft types that flew Instrument Flight Rules (IFR) flights registered with the CFMU in December 1997 and January 1998. The aircraft types are listed in descending order based on the number of total flights for each aircraft type. For each aircraft type the following information is provided:

- aircraft type identifier,
- total number of flights,
- percentage of flights, and,
- cumulative percentage of flights.

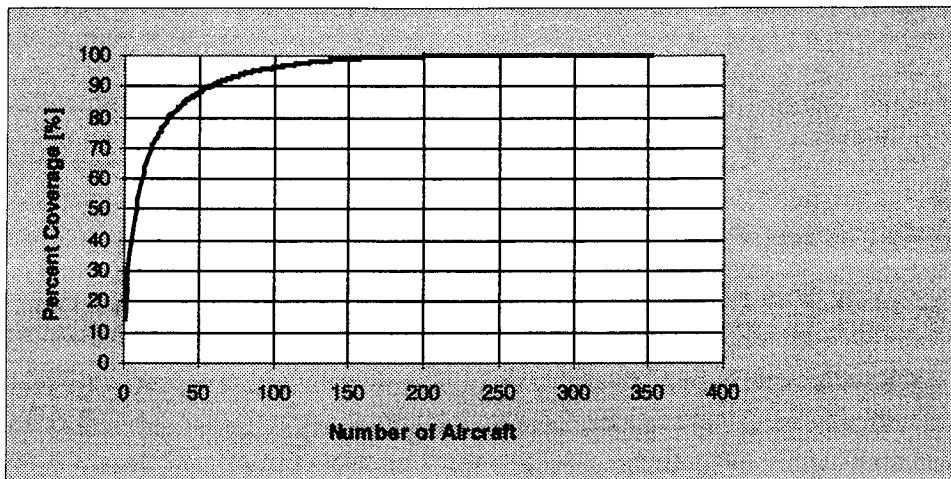
The following summary information can be immediately extracted from the CFMU statistics:

Period	12/97 - 1/98
Total Number of Flights:	1205239
Total Number of A/C Types:	352
Number of A/C types for 90% coverage:	57
Number of A/C types for 99% coverage:	155
Number of A/C types for 99.9% coverage:	234

A comparison with other periods was not made for two reasons:

- 1: This is the first time that data from the CFMU is used instead of the CRCO. The geographical coverage of these two EUROCONTROL units is not the same. A valid comparison is therefore not possible.
- 2: The data only concerns two months. The reason for this is that the CFMU has started using the new ICAO designators [RD2] only since mid November 1997. At the moment of publishing, the only data available in this format was for December 1997 and January 1998.

The combined coverage data for December 1997 and January 1998 is shown graphically in Figure 2.1-1 below.



**Figure 2.1-1: CFMU Air Traffic**

## 2.2 CFMU Aircraft Identifiers

This year for the first time, data from the CFMU has been used to determine the coverage of the european air traffic. There are notable differences between this data and the CRCO data that has been used in the past, namely:

- The CFMU strictly uses the ICAO designators, as opposed to the CRCO that used both ICAO as well as non-ICAO designators.
- The CFMU has started using the new ICAO designators, as defined in RD2, from mid-November 1997 onwards.

The fact that the data is now 100% compliant with the ICAO designators eliminates the necessity of making assumptions about the coverage of certain aircraft (sub-)types.

## 2.3 Comparison with BADA

Appendix B provides a list of the aircraft types modelled by BADA 3.0 [RD1]. In this list the aircraft types are ordered alphabetically by the ICAO code. The only model without an official ICAO code is the FGTR generic fighter model. For each aircraft type (except the FGTR) the percentage of air traffic and ranking as specified by the CFMU statistics is given.

Some further comments on the BADA coverage of the CFMU air traffic are given below.

- (1) The 67 aircraft types modelled by BADA 3.0 are not the 67 most important types for the CFMU traffic sample. That is, according to the CFMU statistics, the top 67 aircraft types should provide 92.1% coverage. The BADA 3.0 types only provide 89.4% coverage. BADA 3.0 provides more than 95 % coverage, if the not directly supported aircraft are also included.

- (2) There are several aircraft types with a significant proportion of the CFMU air traffic, which are not modelled by BADA 3.0. The following 4 A/C types are the most important types not covered by BADA 3.0. The inclusion of the first aircraft into BADA would increase the coverage to above 90%.

B190	Beech 1900	0.80 %
SW4	Swearingen SA-226 AT/TC Merlin 4	0.48 %
E110	Embraer EMB-110	0.35 %
E145	Embraer EMD-145	0.34 %

Note that currently the EEC only has reference data available for one of the 4 types mentioned above, namely the SW4.

### 3. CONCLUSIONS

- (1) BADA 3.0 currently covers 89.4% of the European air traffic as specified by the Eurocontrol CFMU. The coverage has increased with 0.5% compared to 1996 (88.9%).
- (2) The addition of 1 A/C types is required to bring the BADA coverage up to the target of 90%. The A/C type not modelled by BADA 3.0 with the highest share of European air traffic is:

B190              Beech 1900

- (3) Due to the difference in designators, geographical area and time period over which the data was collected it is not possible to make a good comparison between the current coverage data and data from previous years. The current data coverage should therefore be used as the new baseline for future analyses.

## **APPENDIX A**

### **CFMU Traffic Statistics for 12/97 - 1/98**

Type	No. of flights	Percentage	Accumulative Percentage
B73B	167926	13.93	13.93
MD80	100470	8.34	22.27
A320	93402	7.75	30.02
ATR	67766	5.62	35.64
BA46	56066	4.65	40.29
B73A	45572	3.78	44.07
F50	42261	3.51	47.58
DHC8	35482	2.94	50.52
B757	33943	2.82	53.34
B767	30608	2.54	55.88
DC9	28300	2.35	58.23
CARJ	23892	1.98	60.21
SF34	23058	1.91	62.12
B727	22214	1.84	63.97
F100	20508	1.70	65.67
B74A	18818	1.56	67.23
SB20	16341	1.36	68.59
A310	14622	1.21	69.80
B74B	13451	1.12	70.92
BE20	12629	1.05	71.96
JSTA	11739	0.97	72.94
SH36	11414	0.95	73.88
F70	11373	0.94	74.83
ATP	10740	0.89	75.72
A300	10134	0.84	76.56
B190	9585	0.80	77.36
F27	8958	0.74	78.10
DC10	8487	0.70	78.80
F28	8050	0.67	79.47
MD11	7663	0.64	80.11
D328	6986	0.58	80.69
A340	6803	0.56	81.25
C130	6715	0.56	81.81
T154	6415	0.53	82.34
SW4	5735	0.48	82.82
PA34	5542	0.46	83.28
JSTB	5398	0.45	83.72
D228	5247	0.44	84.16
C550	5071	0.42	84.58
E120	4446	0.37	84.95
BE9L	4319	0.36	85.31
E110	4270	0.35	85.66
E145	4156	0.34	86.01
BA11	4039	0.34	86.34
B777	3999	0.33	86.67
PA31	3933	0.33	87.00
T134	3887	0.32	87.32
LJ35	3789	0.31	87.64
L410	3656	0.30	87.94
A748	3434	0.28	88.22

C500	3386	0.28	88.51
FA50	3322	0.28	88.78
GULF	3131	0.26	89.04
MD90	3123	0.26	89.30
L101	3037	0.25	89.55
TRIN	2867	0.24	89.79
SW3	2834	0.24	90.02
C160	2815	0.23	90.26
PA28	2802	0.23	90.49
FA20	2716	0.23	90.72
DC8	2709	0.22	90.94
H25B	2689	0.22	91.16
BE58	2457	0.20	91.37
C560	2349	0.19	91.56
L188	2277	0.19	91.75
FA10	2227	0.18	91.94
CN35	2151	0.18	92.11
CL60	2123	0.18	92.29
A330	2086	0.17	92.46
C421	2065	0.17	92.64
F900	2063	0.17	92.81
C525	1925	0.16	92.97
C208	1916	0.16	93.13
B707	1772	0.15	93.27
F406	1750	0.15	93.42
YK40	1657	0.14	93.55
C650	1635	0.14	93.69
P31T	1584	0.13	93.82
IL76	1579	0.13	93.95
AN24	1573	0.13	94.08
ZZZZ	1550	0.13	94.21
E121	1541	0.13	94.34
C172	1430	0.12	94.46
N262	1376	0.11	94.57
AS65	1374	0.11	94.69
CVLT	1345	0.11	94.80
TBM7	1332	0.11	94.91
DHC6	1263	0.10	95.01
YK42	1256	0.10	95.12
C212	1241	0.10	95.22
AN26	1227	0.10	95.32
C310	1224	0.10	95.42
IL86	1215	0.10	95.53
BN2P	1208	0.10	95.63
LJ55	1206	0.10	95.73
PA42	1185	0.10	95.82
M20	1122	0.09	95.92
C135	1111	0.09	96.01
BE30	1080	0.09	96.10
C210	1071	0.09	96.19
AN12	1069	0.09	96.28
SH33	1057	0.09	96.36
C340	1038	0.09	96.45
TRIS	1019	0.08	96.53

P28R	1015	0.08	96.62
PUMA	948	0.08	96.70
PA46	922	0.08	96.77
B350	905	0.08	96.85
H25A	893	0.07	96.92
PA27	888	0.07	97.00
BE10	876	0.07	97.07
DHC7	869	0.07	97.14
PA44	842	0.07	97.21
C414	810	0.07	97.28
MU30	766	0.06	97.34
F2TH	754	0.06	97.40
BE36	749	0.06	97.47
S76	738	0.06	97.53
BE55	735	0.06	97.59
B74S	719	0.06	97.65
C182	712	0.06	97.71
S61	684	0.06	97.76
C404	675	0.06	97.82
LJ31	670	0.06	97.88
C141	628	0.05	97.93
P3	628	0.05	97.98
P180	587	0.05	98.03
G159	583	0.05	98.08
AS32	552	0.05	98.12
S601	532	0.04	98.17
P68	518	0.04	98.21
C303	503	0.04	98.25
MU2	496	0.04	98.29
C425	480	0.04	98.33
C5	460	0.04	98.37
G222	455	0.04	98.41
AC6T	451	0.04	98.45
CONC	422	0.04	98.48
M339	417	0.03	98.52
SW2	414	0.03	98.55
BE33	407	0.03	98.58
BE76	407	0.03	98.62
GA7	403	0.03	98.65
C402	399	0.03	98.68
H25C	395	0.03	98.72
B12	391	0.03	98.75
PA32	388	0.03	98.78
P28T	387	0.03	98.81
C17	370	0.03	98.84
ATLA	369	0.03	98.88
E3	353	0.03	98.90
IL62	343	0.03	98.93
C441	341	0.03	98.96
H60	329	0.03	98.99
TOR	307	0.03	99.01
LJ60	303	0.03	99.04
BE99	293	0.02	99.06
TOBA	286	0.02	99.09

MS76	281	0.02	99.11
HPR7	277	0.02	99.13
A3ST	272	0.02	99.16
PA30	270	0.02	99.18
AN72	243	0.02	99.20
VC10	243	0.02	99.22
PA23	236	0.02	99.24
AN28	232	0.02	99.26
IL18	228	0.02	99.28
CM11	224	0.02	99.30
BE9T	220	0.02	99.31
PC12	218	0.02	99.33
AS55	214	0.02	99.35
F16	208	0.02	99.37
BE95	200	0.02	99.38
S65C	197	0.02	99.40
F260	178	0.01	99.41
LJ25	170	0.01	99.43
BN2T	164	0.01	99.44
DC6	160	0.01	99.46
F60	158	0.01	99.47
PC7	157	0.01	99.48
A124	156	0.01	99.49
SC7	150	0.01	99.51
PC6T	143	0.01	99.52
VF14	143	0.01	99.53
P808	137	0.01	99.54
AA5	135	0.01	99.55
BE35	132	0.01	99.56
TB30	131	0.01	99.57
BE60	125	0.01	99.59
SH5	125	0.01	99.60
P66T	124	0.01	99.61
VISC	124	0.01	99.62
TUCA	122	0.01	99.63
L200	121	0.01	99.64
L29B	121	0.01	99.65
C177	120	0.01	99.66
AJET	119	0.01	99.67
HAR	115	0.01	99.68
NIM	112	0.01	99.69
AEST	110	0.01	99.69
IL96	109	0.01	99.70
C101	106	0.01	99.71
DC3	105	0.01	99.72
ALO3	104	0.01	99.73
H47	101	0.01	99.74
P210	97	0.01	99.75
F18	91	0.01	99.75
L29A	89	0.01	99.76
CL2T	87	0.01	99.77
WW24	83	0.01	99.77
C337	79	0.01	99.78
ASTR	78	0.01	99.79

B105	77	0.01	99.79
UH1	77	0.01	99.80
F15	76	0.01	99.81
DR40	75	0.01	99.81
JAGR	75	0.01	99.82
G4	72	0.01	99.83
LJ24	71	0.01	99.83
S330	71	0.01	99.84
MF17	64	0.01	99.84
N260	62	0.01	99.85
A109	61	0.01	99.85
AMX	61	0.01	99.86
PA24	61	0.01	99.86
LYNX	55	0.00	99.87
R300	55	0.00	99.87
F104	54	0.00	99.88
F5	48	0.00	99.88
SBR1	45	0.00	99.88
C77R	43	0.00	99.89
BELF	42	0.00	99.89
C152	35	0.00	99.89
H53	34	0.00	99.90
AN32	33	0.00	99.90
BE40	33	0.00	99.90
ALIZ	32	0.00	99.91
F4	32	0.00	99.91
C207	31	0.00	99.91
C206	30	0.00	99.91
FA30	30	0.00	99.92
G2	30	0.00	99.92
P32R	30	0.00	99.92
R90R	30	0.00	99.92
F1	29	0.00	99.93
B06	27	0.00	99.93
CVLP	27	0.00	99.93
STAR	27	0.00	99.93
C335	26	0.00	99.93
HAWK	26	0.00	99.94
HF20	26	0.00	99.94
P68T	26	0.00	99.94
PC9	25	0.00	99.94
Z42	24	0.00	99.94
C750	23	0.00	99.95
GAZL	22	0.00	99.95
BE24	21	0.00	99.95
C411	20	0.00	99.95
CE43	19	0.00	99.95
MIR2	19	0.00	99.95
SBR2	19	0.00	99.96
B222	17	0.00	99.96
DO28	17	0.00	99.96
S360	17	0.00	99.96
HR10	16	0.00	99.96
RF3	16	0.00	99.96

A10	15	0.00	99.96
AC50	15	0.00	99.97
AC68	15	0.00	99.97
WA42	15	0.00	99.97
AA1	14	0.00	99.97
BE19	14	0.00	99.97
FREL	14	0.00	99.97
RALL	14	0.00	99.97
U2	13	0.00	99.97
B720	12	0.00	99.98
MI8	12	0.00	99.98
S210	12	0.00	99.98
S2T	12	0.00	99.98
C150	11	0.00	99.98
CNBR	11	0.00	99.98
H500	11	0.00	99.98
A6	10	0.00	99.98
C320	10	0.00	99.98
MRF1	10	0.00	99.98
P32T	10	0.00	99.98
TAMP	10	0.00	99.98
AN30	9	0.00	99.99
DHC5	9	0.00	99.99
PL12	8	0.00	99.99
DH60	7	0.00	99.99
UH12	7	0.00	99.99
BK17	6	0.00	99.99
C72R	6	0.00	99.99
CL2P	6	0.00	99.99
L29	6	0.00	99.99
EXPL	5	0.00	99.99
OSCR	5	0.00	99.99
AC6L	4	0.00	99.99
AN22	4	0.00	99.99
BE50	4	0.00	99.99
BE80	4	0.00	99.99
CL4G	4	0.00	99.99
MG29	4	0.00	99.99
PC6P	4	0.00	99.99
ST10	4	0.00	99.99
T204	4	0.00	99.99
W3	4	0.00	99.99
C15	3	0.00	99.99
D28T	3	0.00	99.99
F111	3	0.00	100.00
M21	3	0.00	100.00
MIR4	3	0.00	100.00
T250	3	0.00	100.00
AC72	2	0.00	100.00
B24	2	0.00	100.00
B60	2	0.00	100.00
BE56	2	0.00	100.00
BSTP	2	0.00	100.00
DR10	2	0.00	100.00

ETAR	2	0.00	100.00
FW44	2	0.00	100.00
GA20	2	0.00	100.00
PA22	2	0.00	100.00
R44	2	0.00	100.00
S61R	2	0.00	100.00
A122	1	0.00	100.00
B209	1	0.00	100.00
B36T	1	0.00	100.00
BE12	1	0.00	100.00
C123	1	0.00	100.00
C125	1	0.00	100.00
C140	1	0.00	100.00
C21T	1	0.00	100.00
CH1	1	0.00	100.00
CH10	1	0.00	100.00
CL41	1	0.00	100.00
D28D	1	0.00	100.00
DH83	1	0.00	100.00
EC35	1	0.00	100.00
FA11	1	0.00	100.00
LJ23	1	0.00	100.00
M7T	1	0.00	100.00
MICO	1	0.00	100.00
P66P	1	0.00	100.00
PA12	1	0.00	100.00
PA36	1	0.00	100.00
PELI	1	0.00	100.00
PTS2	1	0.00	100.00
PZ04	1	0.00	100.00
S05R	1	0.00	100.00
T34P	1	0.00	100.00

## **APPENDIX B**

### **BADA 3.0 Coverage Statistics**

ICAO Code	Aircraft Type	Traffic %	CFMU Rank
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- A300	AIRBUS A300	0.84	25
- A310	AIRBUS A310	1.21	18
- A320	AIRBUS A320	7.75	3
- A330	AIRBUS A330	0.17	69
- A340	AIRBUS A340	0.56	32
- ATP	BAE ADVANCED TURBOPROP	0.89	24
- ATR	ATR 42/72	5.62	4
- B707	BOEING 707-300/400 SERIES	0.15	74
- B727	BOEING 727, ALL SERIES	1.84	14
- B73A	BOEING 737-100/200 SERIES	3.78	6
- B73B	BOEING 737-300/400/500 SERIES	13.93	1
- B73C	BOEING 737-600/700/800 SERIES	0.00	--
- B74A	BOEING 747-100/200/300 SERIES	1.56	16
- B74B	BOEING 747-400	1.12	19
- B757	BOEING 757, ALL SERIES	2.82	9
- B767	BOEING 767, ALL SERIES	2.54	10
- B777	BOEING 777, ALL SERIES	0.33	45
- BA11	BAE ONE ELEVEN, ALL SERIES	0.34	44
- BA46	BAE146-100/200/300 RJ SERIES	4.65	5
- BE20	BEECH SUPER KING AIR 200/HURON	1.05	20
- BE99	BEECH AIRLINER C99	0.02	157
- BE9L	BEECH KING AIR 90	0.36	41
- C130	LOCKHEED HERCULES	0.56	33
- C160	TRANSALL C160	0.23	58
- C421	CESSNA 421 GOLDEN EAGLE	0.17	70
- C550	CESSNA CITATION IIS2	0.42	39
- C560	CESSNA CITATION V	0.19	64
- CARJ	CANADAIR REGIONAL JET	1.98	12
- CL60	CANADAIR CHALLENGER CL600/601	0.18	68
- D228	DORNIER 228-100/200	0.44	38
- D328	DORNIER 328	0.58	31
- DC10	DOUGLAS DC-10, ALL SERIES	0.70	28
- DC8	DOUGLAS DC-8, ALL SERIES	0.22	61
- DC9	DC9/20/30/40/50/NIGHTINGALE/SKYTRAIN II	2.35	11
- DHC8	DASH 8 ALL SERIES	2.94	8
- E120	EMBRAER BRASILIA EMB-120/HB/RT	0.37	40
- F27	FOKKER FRIENDSHIP F 27	0.74	27
- F28	FOKKER FELLOWSHIP F 28	0.67	29
- F50	FOKKER 50	3.51	7
- F70	FOKKER 70	0.94	23
- F100	FOKKER 100	1.70	15
- F900	DASSAULT FALON 900	0.17	71
- FA10	DASSAULT FALCON 10	0.18	66
- FA20	DASSAULT FALCON 20 FJF/C/D/E/F	0.23	60
- FA50	DASSAULT FALCON 50	0.28	52
- FGTR	GENERIC FIGHTER	0.00	--
- H25B	HS 125-400/600/700 BAe 125-800	0.22	62
- JSTA	BAE JETSTREAM 31	0.97	21
- JSTB	BAE JETSTREAM 41	0.45	37
- L101	LOCKHEED TRISTAR, ALL SERIES	0.25	55
- LJ35	LEARJET 35/36	0.31	48
- MD11	MCDONNELL-DOUGLAS	0.64	30

- MD80	<b>MD-11</b> DOUGLAS MD-80/81/82/ 83/87/88	8.34	2
- MU2	MITSUBISHI MARQUISE/ SOLITAIRE	0.04	133
- P31T	PIPER CHEYENNE II	0.13	78
- PA27	PIPER AZTEC	0.07	110
- PA28	PIPER CHEROKEE/AR CHER II/DAKOTA/PIL LAN/WARRIOR	0.23	59
- PA31	PIPER CHIEFTAIN/ MOJAVE/NAVAJO/T1020	0.33	46
- PA34	PA34-200T SENECA-3	0.46	36
- PA42	PIPER CHEYENNE III/IV, 400SL	0.10	96
- SB20	SAAB 2000	1.36	17
- SF34	SAAB SF 340	1.91	13
- SH36	SHORTS 360	0.95	22
- SW3	FAIRCHILD MERLIN IVC ,METRO III	0.24	57
- T134	TUPOLEV TU-134/134A/B	0.32	47
- T154	TUPOLEV TU-154/154A/B/B2/ C/M	0.53	34
- TRIN	SOCATA TRINIDAD	0.24	56

**Total = 89.4 %**

